The following was put forth as a possible justification for requiring a 99.6% SO_2 control efficiency for the CFB boilers:

> "If 100 pounds of sulfur were introduced into the CFB boiler, 92 pounds would be bound up in the limestone bed and 8 pounds would be introduced into the dry scrubber. At a 95 per cent removal rate 7.6 pounds of the sulfur would be captured by the dryer and 0.4 lb released to the atmosphere. In this example, the overall capture rate would be 99.6%."

While the conclusion of this statement is mathematically correct, this method and approach is not used to set BACT emission limits for PSD permits. The BACT emission rate for the boilers was not determined by "compounding" theoretical control efficiencies of the two different technologies (limestone injection followed by flue gas desulfurization). DEQ research indicates efficiencies obtained from limestone injection may not reach 92%. Literature indicates a value of about 90% may be more appropriate as a design maximum.

The SO_2 24-hour BACT emission rate of 0.12 lb/MMBtu is the result of DEQ's engineering and BACT research on similar operating and demonstrated units with similar fuels, operating in similar conditions. The source originally proposed 0.15 lb/MMBtu as a maximum emission rate in their application, but DEQ's research and engineering review determined the appropriate BACT emission rate would be 0.12 lb/MMBtu. This rate corresponds to an emissions rate of 751.68 lb/hr of SO_2 at the combined maximum input heat capacity of 6,264 MMBtu for the two CFB boilers.

Below is a discussion and illustration of how one could estimate SO_2 control efficiency for this facility, using anticipated fuels and fuel blends:

> Run- of- mine (ROM) coal to be used as fuel for the facility is rated at 7,782 Btu/lb for heating value, and contains a maximum of 2.28% sulfur by weight. The waste coal to serve as fuel has a heating value of 2,738 Btu/lb, and contains a maximum of 1.0% sulfur by weight. The firing rate of ROM coal is 804,934 lb/hr, at the maximum input heat capacity of 6,264 MMBtu/hr for both CFB boilers. This is derived by dividing the 6,264 MMBtu/hr value by 7,782 Btu/lb, as the heating value of ROM coal. Waste coal is expected to be burned as a unit load of 60% waste coal and 40% ROM coal.
>
> The molecular weight of SO_2 is 64, based on atomic mass of 32 for sulfur and 16 for oxygen.
>
> Removal/control efficiency for SO_2 with combustion of ROM coal only:
> Hourly input of sulfur at maximum load = (804,934 lb/hr)(2.28/100) = 18,352.5 lb/hr
> Hourly formation of SO_2 = (18,352.5 lb/hr)(64/32) = 36,705 lb/hr
>
> $$\text{Removal efficiency} = \frac{36{,}705\text{ lb/hr} - 751.68\text{ lb/hr}}{36{,}705\text{ lb/hr}} = 0.9795\ (\text{x } 100) = 98\%$$
>
> Removal/control efficiency for SO_2 with combustion of waste coal only:
> Hourly input of waste coal at max.load = (6,264)(10^6 Btu)/(2,738 Btu/lb) = 2,287,801 lb
> Hourly input of sulfur at max. load = (2,287,801 lb/hr)(1/100) = 22,878 lb/hr
> Hourly formation of SO_2 = (22,878 lb/hr)(64/32) = 45,756 lb/hr
>
> $$\text{Removal efficiency} = \frac{45{,}756\text{ lb/hr} - 751.68\text{ lb/hr}}{45{,}756\text{ lb/hr}} = 0.9836\ (\text{x } 100) = 98.4\%$$
>
> Removal/control efficiency for SO_2 with combustion of 60% waste/40% ROM coal:
> Heat content of waste/ROM coal = (0.6)(2,738/lb) + (0.4)(7,782 Btu/lb) = 4,755.6 Btu/lb
> Hourly input of waste/ROM coal = (6,264)(10^6 Btu)/(4.755.6 Btu/lb) = 1,317,184 lb
> Hourly input of waste coal = (0.6)(1,317,184 lb) = 790,310 lb
> Hourly input of ROM coal = (0.4)(1,317,184 lb) = 526,874 lb
> Hourly input of sulfur = (790,310 lb)(0.01) + (526,874 lb)(0.0228) = 19,915.8 lb
> Hourly formation of SO_2 = (19,915.8 lb)(64/32) = 39,831.7 lb
>
> $$\text{Removal efficiency} = \frac{39{,}831.7\text{ lb/hr} - 751.68\text{ lb/hr}}{39{,}831.7\text{ lb/hr}} = 0.9811\ (\text{x } 100) = 98.1\%$$